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SELECTIVE SIGNALING SYSTEM

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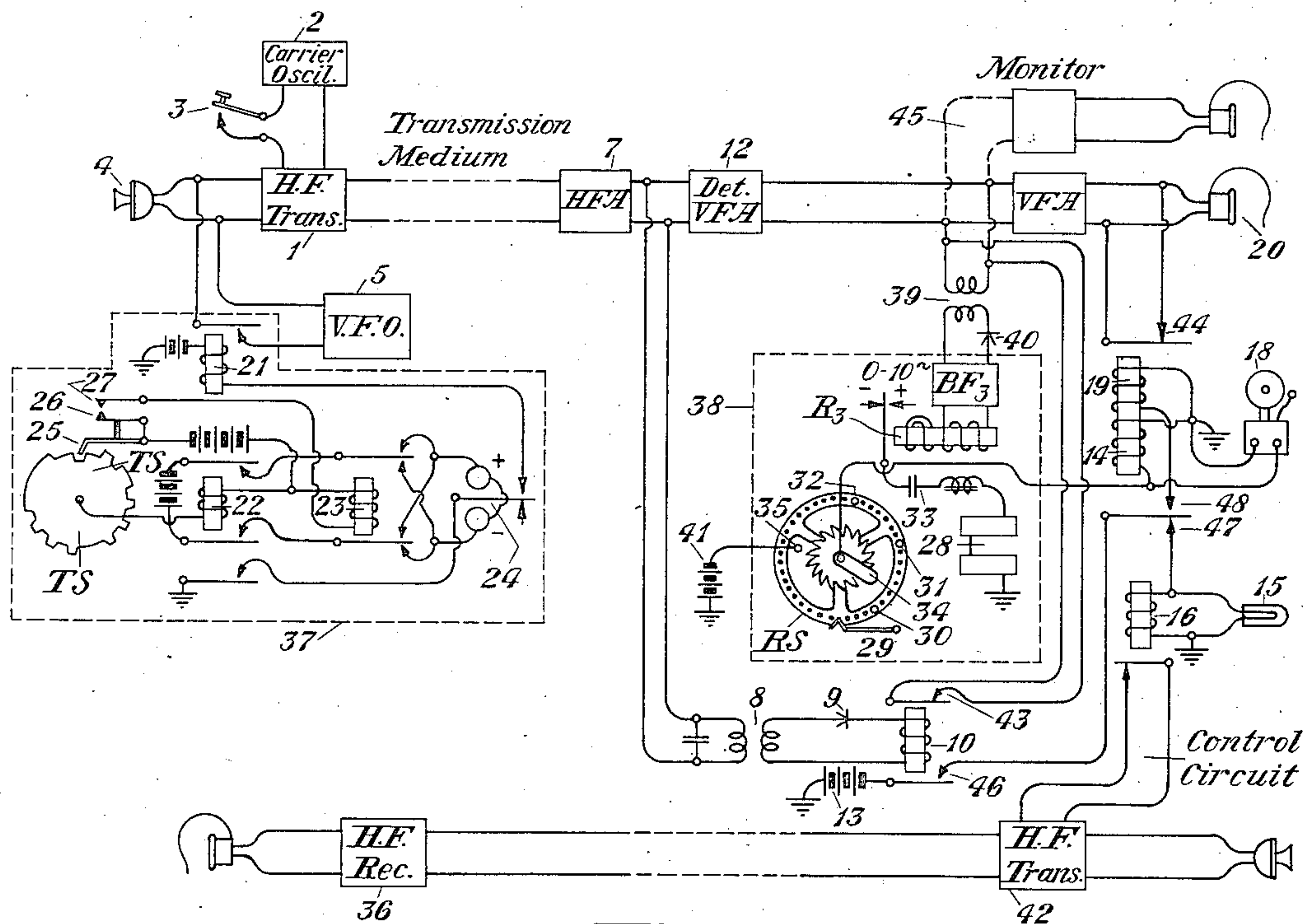


Fig. 1

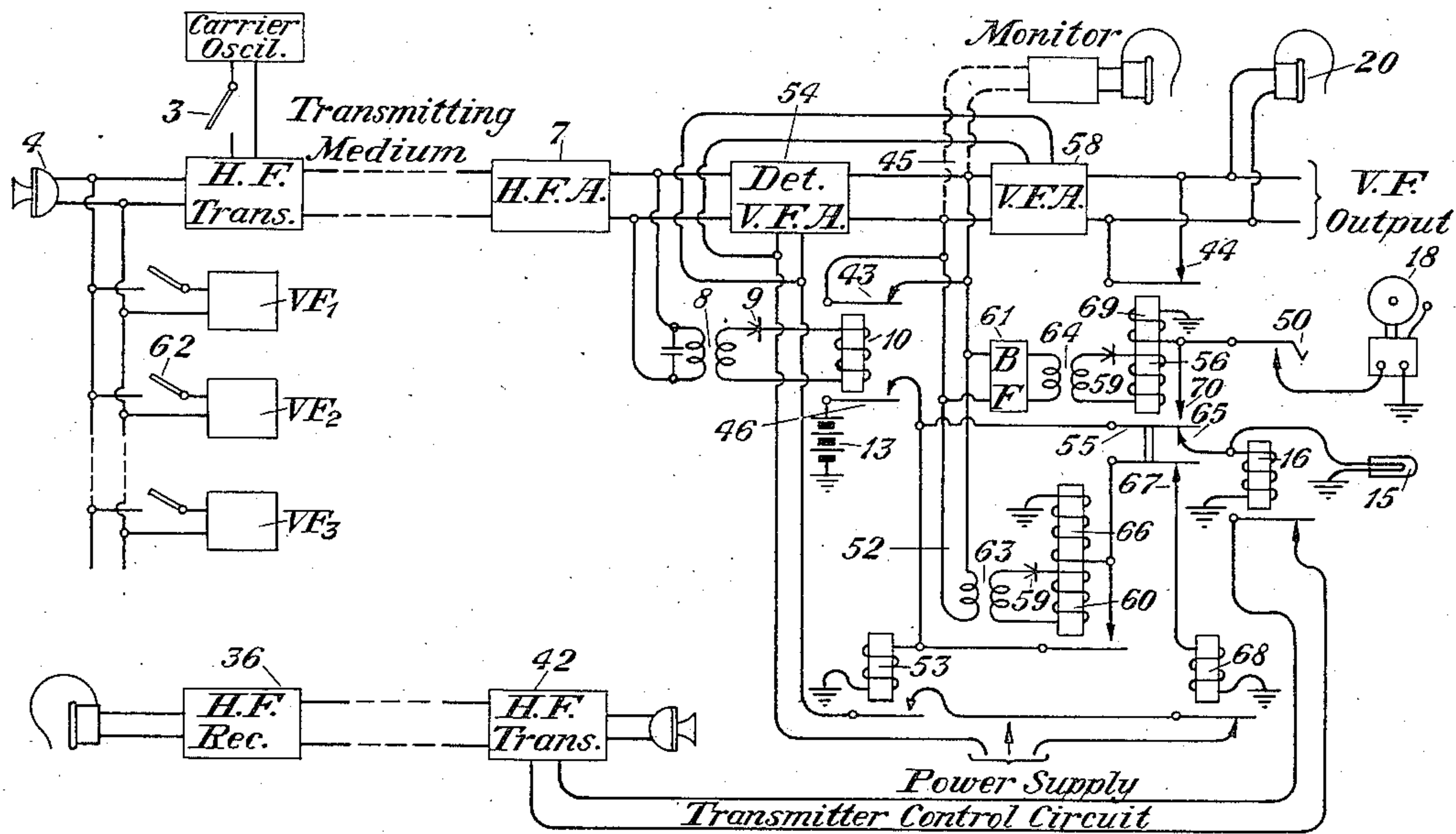


Fig. 2

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SELECTIVE SIGNALING SYSTEM

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11 Claims. (Cl. 179—84)

This invention relates to high frequency transmission systems employing radiated waves or waves directed by wave guides and to the control of apparatus by pulses or selective signals sent from one station to another in such systems. More particularly, it relates to arrangements for selectively calling one or more stations from a control station while leaving all other stations inoperative.

10 In high frequency communication systems characterized by groups of stations intercommunicating by a common medium or by frequencies used in common, the communication of one station to another station may be heard at all stations, and any station may break into the communication by operating its transmitter. One object of the present invention is to provide means whereby such overhearing or interruption may be prevented.

20 In accordance with this invention all receivers are rendered inoperative unless released by signals from another station for that purpose. Circuit arrangements are provided whereby the carrier frequency, emanating from one station, may operate a busy signal and disable circuits at other stations, while code signals superimposed upon the carrier may operate a call signal at a desired station or stations, and operate means to put apparatus at such stations in operative condition, and may leave the apparatus at all other stations incapable of operation.

35 The invention may be more fully understood from the following description when read in connection with the accompanying drawing which is:

Fig. 1 showing a simple form of the invention employing carrier and code signals for calling, operating a busy signal and performing other control functions.

40 Fig. 2 showing another form of the invention as applied to a different form of code signaling and including further operations at the controlled station.

45 In these illustrations the left portion of the figures represents a control station adapted to control and communicate with a number of secondary or controlled stations, of which for simplicity but one is illustrated at the right hand of the figures.

50 Referring to Fig. 1, the high frequency transmitter 1, which may be a radio transmitter and which may be associated with a receiver 36 for two-way communication, is supplied with carrier frequency from an oscillator 2, through a switch 55 3. This carrier may be modulated in the trans-

mitter by voice currents emanating from the telephone instrument 4 or by tone current from the oscillator 5, the tone being emitted in pulses determined by the operation of the code sender shown in the box 37.

5 When switch 3 is closed, carrier passes from the output of the transmitter to the transmitting medium, which may be free space as in radio or may be some form of guiding agency, for example, a pair of wires, or a coaxial conductor. At the 10 receivers of the controlled stations, of which but one is illustrated in Fig. 1, the incoming signals pass through the high frequency amplifier 7. Across the output of this amplifier is bridged the tuned transformer 8 which selects the carrier 15 frequency, which is thereupon rectified to unidirectional current by the rectifier 9 and operates the relay 10. Operating the upper tongue of this relay opens the contacts 43 which otherwise short circuit input terminals of transformer 39. Operating the lower tongue of relay 10 closes contacts 46 and connects battery 13 through contacts 47 of relay 14 to busy signal lamp 15 and thence by ground return back to battery 13, thereby lighting the busy signal and advising the operator that the control station is transmitting. 25 At the same time the relay 16, in parallel with the signal lamp, is operated, whereby the relay contacts, which are in series with a transmitter control circuit, are opened and the transmitter rendered inoperative. This control circuit may be of any desired kind such, for example, as the power supply control. Contacts 44 short circuit the input of telephone receiver 20 and render it inoperative unless relay 14 is operated as will 35 be described later. It is evident then that whenever the carrier from the control station is sent out by the closing of switch 3, all stations within its jurisdiction are thereby rendered inoperative for transmitting and remain so for receiving messages but are put in condition to receive signals suitable to pass through transformer 39 and actuate the apparatus connected to it. 40

45 To release one of these stations for communication and to call its operator is the function of the code sender 37, the selector 38, and the apparatus operated thereby, as will be described. The code sender 37 and selector 38 are identical with those illustrated in Figs. 1 and 2, respectively, of Patent No. 1,464,565 to Espenschied et al, and function in identically the same manner. Since a detailed understanding of the operation of this apparatus is not essential to an understanding of the present invention, reference is 55

made to the above mentioned patent for a complete description.

In the code sender, disc TS is toothed in accordance with a code. When rotated it operates contacts 26 and 27 and thereby, through relays 22, 23 and 24, as described in the patent referred to, causes the contacts of relay 21 to open and close in accordance with the code represented on the toothed disc. Such operation of these contacts permits pulses of voice frequency tone current from oscillator 5 to enter the transmitter 1 and be transmitted from its output as modulation of the carrier. The code sent from a particular disc is characteristic of a particular station among the group which may be called. Thus there may be a large number of code senders associated with the oscillator 5 and the transmitter 1 if it be desired to call any one of a considerable number of stations. Let it be assumed that the code sent by sender 37 is that to which selector 38 is responsive.

The carrier modulated with the voice frequency tone pulses passes through the transmission medium which may be either wire or radio transmission or some form of wave guide, is amplified by the high frequency amplifier 7, detected by the detector 12 which may also include an amplifier and, as voice frequency pulses, passes through the transformer 39. Rectified by rectifier 40 to pulsating direct current, the code signals pass into the selector 38. Through low pass filter BF₃ they operate relay R₃, and as described in the above mentioned Espenschied patent, act to turn selector wheel RS until contacts 34 and 35 come together, thereby closing for a few moments the circuit from battery 41 through call bell 18 and the lower winding of relay 14. After this contact interval the selector wheel falls back to its waiting position ready to respond again if code wheel TS is again operated. The selector 38 is so arranged that contacts 34 and 35 will close only when a code peculiar to that selector is received. Thus bell 18 and relay 14 are not operated at other stations than the called station.

Operation of relay 14 opens contacts 44 which removes the short circuit from the voice output of the receiver, thereby permitting the receiving of messages in the telephone receiver 20. Operation of relay 14 also opens contacts 47 which cuts off signal lamp 15 and releases relay 16, thereby permitting operation of the transmitter 42 so that it may be used for sending messages to the control station. Current flows from battery 13 through contacts 46 of relay 10 and contacts 48, now closed by operation of relay 14, to the winding 19, thereby locking the relay 14 in closed position. When selector wheel RS falls back, opening contacts 34 and 35, bell 18 ceases to ring but relay 14 remains operated by virtue of locking winding 19 as explained above. Communication, both transmitting and receiving, may now be carried on at the station or stations whose code signal has been emitted by the control station, as long as the carrier is present. If the carrier is shut off by opening switch 3 the relay 10 restores which in turn causes relay 14 to restore and the called stations go back to their original condition. Other stations not called are also restored to normal waiting condition by the release of relay 10 since thereby battery is removed from lamp 15 and relay 16.

If it is desired to originate a call from a controlled station, the following procedure takes place. The operator at the controlled station

selects a time when his busy lamp 15 is extinguished, indicating that the control station is idle. He then operates his transmitter 42 and calls the control station through its receiver 36 either by code calling or by voice, depending on the facilities provided by this channel, and announces his designation to the control station. In order to answer the call the control station operator must close his switch 3, which permits carrier to go out, thereby rendering the calling station code signal selector unit operative as above described. The control station operator has, by listening or through the agency of his code receiver, been advised of the designation of the calling station and he sends the code signal for it, thereby putting it into operative condition but leaving all other stations silenced as described above.

If at any time a called station operator does not answer, the called station may be restored to normal waiting condition by opening switch 3 momentarily, which permits relay 10 to release, thereby unlocking and restoring relay 14.

In some stations it may be desirable to let the operator listen in on all transmissions of the control station. This may be accomplished by connecting a monitoring amplifier and telephone receiver as indicated by the dotted lines 45. As already described signals will reach this point of connection at all times when carrier is being received and relay 10 is operated.

Fig. 2 illustrates a system similar to that of Fig. 1 in that the unmodulated carrier component of the transmission and code signals modulated thereon are employed for control. It differs in that additional operations are included in the control exercised. Also for variety another form of code signaling adapted to this invention is shown.

The transmitting control station is identical to that in Fig. 1, as may be noted from the drawing, except that the type of voice frequency code signals is different. Selective signaling is attained by using a different voice frequency for each station or station group. Elaborations of such a system to increase the number of codes possible by employing two or more tones simultaneously may be employed without departing from the principles of the invention herein disclosed. The individual calling tones are supplied by individual oscillators VF₁, VF₂—VF_n, which may be connected to the transmitter input by switches as shown. Obviously, an adjustable oscillator and a single switch may be employed as an alternative.

At a receiving station, carrier arriving through high frequency amplifier 7 passes through transformer 8 to rectifier 9 and relay 10 which is operated by the unidirectional current resulting from the action of the rectifier. The opening of the upper contact 43 of relay 10 removes the short circuit across the code signal receiver unit input 52. The receiving system is disabled for message use by contacts 44 short-circuiting telephone receiver 20. Closing of the lower contact 46 of relay 10 connects battery 13 to relay 53 which thereupon operates to close the circuit supplying power to the amplifier and detector unit 54, and the amplifier 58, thus putting them in active condition to pass incoming messages or code signals. Battery 13 is also connected simultaneously to tongue 55 of relay 56 which rests on contact 65 connected to relay 16. Relay 16 upon thus being operated opens the transmitter control circuit, making the transmitter 42 in-

operative. Busy signal lamp 15, in parallel with the windings of relay 16 is also caused to glow. It is evident that when carrier is sent from the control station, all secondary stations will be incapable of transmitting or receiving messages, will have their busy signal lamps operated, and will have turned on additional amplifiers required for code signals or messages but not required for the initial utilization of the carrier control signal already described.

It will be noted that circuit 52 is bridged across the connection from detector 54 to amplifier 58. Circuit 52 leads to transformer 63 which is capable of passing any of the tones generated by the oscillators VF_1 — VF_n . Any such tone passing into this circuit is rectified by the rectifier 59 and operates the relay 60. The transformer 64 likewise is provided with a rectifier 59 whereby any tone entering it may operate relay 56. This circuit is, however, entered only through the band filter 61 which excludes all tones except the one assigned as the selective call for that station. In the particular case illustrated it is assumed that the band filter passes the frequency of oscillator VF_2 .

The control station operator desiring to call a particular station, for example the one illustrated, closes switch 62 for a few moments, thus permitting tone to be transmitted through the system to the receiving circuits. This tone will affect circuit 64 at only one station. Thus, relay 56 will be operated at but one station—that which it is desired to call. Relay 60 will, as explained above, be operated at all stations. This relay, it will be noted, has in addition to the operating winding also a locking winding 66 through which current from battery 13, through contacts 46 of relay 10, is able to flow, thus holding relay 60 closed after switch 62 has been opened and tone is no longer received. At stations other than the called station operation of relay 60 connects battery 13 to contacts 67 of relay 56, causing operation of relay 68 which opens the power supply to the detector and amplifier, thereby saving power.

Returning now to the called station, operation of relay 56 as explained above connects tongue 55 to contacts 70, permitting current from battery 13 to flow through locking winding 69 which holds relay 56 in the operated position after switch 62 is opened and tone ceases to be received in circuit 64. By the same operation, battery is connected to call bell 18 which rings until switch-hook 50 is released by the operator in picking up telephone receiver 20 to answer the call. Opening of contacts 44 of relay 56 removes the short circuit from the voice frequency output of the receiver and permits receipt of messages in the telephone receiver 20. Operation of relay 56 opens also contacts 65, putting out lamp 15, and releasing relay 16 thereby putting the transmitter 42 into operative condition. Likewise, opening of contacts 67 prevents operation of relay 68, thus continuing the supply of power to the detector and amplifiers 54 and 58. The called station is then able to communicate freely with the control station while all other stations remain in an inoperative condition.

When the control station operator wishes to release the called station and return all stations to the waiting condition, he has merely to open switch 3, thus interrupting the flow of carrier. This in turn will release relay 10 at all stations, which by opening contacts 46 disconnects battery 13, which releases all other relays.

Any secondary station operator desiring to originate a call would wait until his busy signal is out and his apparatus thus indicated to be in the waiting condition. He would then operate his transmitter 42 to call the control station and announce his own code designation. The control station may then call him in the usual way.

It will be evident that, while the invention has been described above in connection with two-way communication systems, it is not limited to this use but may be applied to one-way communication systems such as broadcasting systems. For example, if transmitter 42 with its control circuit, and receiver 36 are eliminated from Figs. 1 and 2, the illustrations then delineate one-way communication systems in which a central control transmitting station is able to select from time to time the receivers which it will permit to listen. Such an arrangement might be employed to deliver different program items to different receiving stations in accordance with a pre-arranged scheme.

The system is adapted to telegraph transmission simply by replacing telephone transmitter 14 with a suitable form of voice frequency tone telegraph transmitter and replacing telephone receiver 20 with a corresponding telegraph receiver. These could, for example, be printing telegraph instruments arranged as described in a paper entitled "Application of Printing Telegraph to Long Wave Radio Circuits", by Austin Bailey and T. A. McCann, published in Volume X, pages 601,615 of the Bell System Technical Journal.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated without departing from the spirit of the invention as defined in the following claims.

I claim:

1. In an electric wave signaling system a transmitter, means for controlling the signals sent out from said transmitter, said means including a source of selective code signals, a transmission medium, a receiver, means normally disabling the output of said receiver, means responsive to selective code signals to reenale said output, and means controlled from said transmitter for restoring said responsive means to normal at will.

2. An electric wave transmitter and associated therewith a controllable source of carrier frequency and a code signal transmitter, a transmitting medium, an electric wave receiver, means normally disabling an output of said receiver, a code signal selector, means responsive thereto to reenale said receiver output, and means controlled from said transmitter for restoring said responsive means to normal at will.

3. An electric wave transmitter and associated therewith a controllable source of carrier frequency and a code signal transmitter, a transmission medium, an electric wave receiver adapted to receive said carrier, means responsive to receipt of said carrier to enable additional receiving means adapted for receiving code signals and messages, means responsive to all code signals to disable said additional receiving means, a selective code signal receiver responsive to particular code signals and means responsive thereto to prevent the disabling of said additional receiving means.

4. An electric wave transmitter, associated therewith means for controlling signals sent out from said transmitter, said means including a source of selective code signals, a transmitting

medium, a plurality of electric wave receivers and in association therewith means normally disabling the message outputs of all receivers, and at each station means responsive to selective
5 code signals to reenable the output of the associated receiver.

5. An electric wave transmitter, associated therewith a controllable source of carrier frequency and code signal transmitting means
10 whereby code signals may be transmitted as modulations of the carrier wave, a transmitting medium, a plurality of electric wave receivers adapted to receive said modulated carrier, means associated with said receivers normally to disable
15 the message output of said receivers, associated with each receiver a code selector, means responsive thereto to reenable the output of the associated receiver, and means controlled from said transmitter for restoring said responsive
20 means to normal at will.

6. An electric wave transmitting station adapted to send a carrier frequency and modulated thereon selective code signals characteristic of any receiving station, a transmitting medium, a
25 plurality of receiving stations including at each a code selector adapted to receive a particular selective code signal from said transmitting station, means at each receiving station in normal condition to suppress the message output of the
30 station, means responsive to said code selector to release said output, and means controlled from said transmitter for restoring said responsive means to normal at will.

7. In a high frequency carrier current signaling and control system a transmitter, means
35 for controlling the signals sent out, said means including a source of selective code signals, a transmission medium, a receiver and in association therewith a transmitter, means responsive to carrier current from said first mentioned
40 transmitter to disable said second mentioned transmitter, and means responsive to selective code signals superposed on the carrier current for reenabling said second mentioned trans-
45 mitter.

8. In a high frequency carrier current signaling and control system, a high frequency transmitter, means for controlling the signals sent out from the transmitter, said means including
5 a source of selective code signals, a transmission medium, a receiver and in association therewith a transmitter, means responsive to carrier current from the first mentioned transmitter to disable said second mentioned transmitter, and
10 means responsive to selective code signals superposed on the carrier current to reenable said second mentioned transmitter.

9. In a high frequency signaling and control system, a high frequency transmitter, means for
15 applying a carrier frequency thereto, means for modulating said carrier with code signals, a transmitting medium, a receiver and associated therewith a transmitter, means responsive to the presence of received carrier to disable said second
20 mentioned transmitter, selective code signal receiving means responsive to certain of said code signals to reenable said second mentioned transmitter.

10. In a signaling and control system a source of carrier, means for generating selective code
25 signals, means for modulating said carrier by said signals, means for transmitting said modulated carrier, a receiver and a transmitter associated therewith, means responsive to the unmodulated carrier component to disable said second men-
30 tioned transmitter, a selective code signal receiver and means responsive thereto to reenable said disabled transmitter.

11. A signaling system including a source of
35 carrier, a source of selective code signals, means for modulating said signals on said carrier, means for transmitting the resulting modulated carrier signals, a transmission medium, means for receiving said modulated carrier signals, means re-
40 sponsive to the unmodulated carrier component to operate a busy signal and means responsive to a particular code signal to restore said busy signal.

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